

northeastern lower Michigan, extreme eastern upper Michigan, and southwestern South Dakota more than ten inches fell; and in central Maine, southeastern Massachusetts, central New Hampshire and Vermont, and extreme northwestern Oregon, more than five inches fell. In the Atlantic coast states appreciable snowfall was reported as far south as southern Virginia; in the Ohio Valley to southern Ohio; in the upper lake region to the southern shore of Lake Michigan; in the upper Mississippi valley to southeastern Minnesota; on the eastern slope of the Rocky Mountains to the northern part of the Panhandle of Texas; in the plateau region to extreme southeastern Arizona; and on the Pacific coast southwestward in western Oregon to about the forty-fourth parallel.

Snowfall of five inches, or more, was reported as follows, and in states and territories where the maximum depth was less than that amount, the station reporting the greatest is given:

Arizona.—Cooley Springs, 14; Show Low, 10. *California*.—Summit, 26; Cisco, 15; Emigrant Gap, 14. *Colorado*.—Alma, 43.5; Fraser, 35; Boulder Cañon, 32; Agate and Durango, 30; Ranch, near Como, 26.3; Box Elder, 25; Monte Vista, 24; Breckenridge, 21.5; West Cliff, 19; Abbott, 16; San Luis Experimental Station, 15.5; Yuma and Peyton, 15; Eagle Farm, 14; Colorado Springs, 13.8; Kirk, 13.5; Georgetown, 12.5; Brush, Deer Trail, and Fort Morgan, 12; Cañon City, 11.5; Hardin, 11.2; Aroya and Wray, 10; Sanborn, 9.1; Carlisle and Thon, 9; Beaver Creek, 8.9; Bennet, Denver, and Watervale, 7; Apishapa, Delta, and Husted, 6; Fort Crawford, and Sunnyside, 5.3; Cheyenne Wells, Kit Carson, and Leadville, 5. *Connecticut*.—Southington, Wallingford, and Waterbury, 3. *Idaho*.—Era, 1. *Indiana*.—Point Isabel, 0.8. *Kansas*.—Weskan, 12; Grainfield and Tribune, 7.5; Leoti and Winona, 7; Lakin and Oakley, 6; Monument and Shields, 5. *Kentucky*.—Newport Barracks, trace. *Maine*.—Mayfield, 7; Farmington, 6.5; Cornish and Orono, 6; West Jonesport, 5. *Massachusetts*.—Cotuit, 6. *Michigan*.—Fort Brady, 12.9; Roscommon, 10; Grayling, 9; Crystal Falls, 8.5; Alpena, 6.9; Caldwell and Ivan, 6. *Minnesota*.—Duluth, 1.5. *Montana*.—Blackfeet Agency, 3.5. *Nebraska*.—Kimball, 15.7; Hay Springs, 7.5. *Nevada*.—Ruby Hill, 26. *New Hampshire*.—Plymouth, 6; Berlin Mills and West Milan, 5. *New Jersey*.—Egg Harbor City, 1. *New Mexico*.—Santa Fé, 4.5. *New York*.—Fort Wadsworth, 3. *North Dakota*.—Fort Buford, 3.5. *Ohio*.—Carrolton and Columbus, 2. *Oregon*.—Vernonia, 7.5. *Pennsylvania*.—Mauch Chunk, 3. *Rhode Island*.—Kingston and Lonsdale, 3. *South Dakota*.—Spearfish, 10.5; Oelrich, 8; Fort Meade, 7.1. *Texas*.—Ochiltree, 3. *Vermont*.—Chelsea,

6. *Virginia*.—Woodstock, 2. *Washington*.—Fort Townsend, 1. *West Virginia*.—Mount Alto and Seven Pines, 3. *Wisconsin*.—Summit Lake 0.5. *Wyoming*.—Cheyenne, 22; Fort D. A. Russell 12.

DEPTH OF SNOW ON GROUND AT CLOSE OF MONTH.

Chart iv shows the depth of snow reported on the ground at the close of the month. In the north-central part of upper Michigan one-half inch of snow was reported; in central-lower Michigan two-tenths inch, and in central Vermont, trace. No reports of snow on the ground at the close of the month have been received from other sections of the country. At the close of March, 1890, snow was generally reported on the ground north of the thirty-seventh parallel and east of Arizona, in the middle plateau region, on the northeastern slope of the Rocky Mountains, and over the eastern part of the upper plateau region.

HAIL.

Description of the more severe hail storms of the month are given under the heading "Local storms." Hail was reported as follows: 1st, Ariz., Colo., Tex. 2d, La., Tex. 3d, Ill. 4th, Md., N. Y., Ohio, Wash. 6th, Ill., Iowa, Mo., Oregon, Va., Wash. 7th, Ill., Ind., Iowa, Minn., Pa., Wash., Wis. 8th, Conn., Ill., Ind., Iowa, Ky., Mass., Mich., N. Mex., N. Y., Ohio, Pa., Wis. 9th, Ala., Conn., Ill., Ind., Iowa, Ky., Md., Mich., N. J., N. Y., N. C., Ohio, Pa., Va. 10th, Iowa, N. Y., N. C., Ohio, Pa., Va., Wash., W. Va. 11th, Oregon, Wash. 12th, Ohio, Oregon, Wash., Wis. 13th, Ill., Iowa, Mo. 14th, Iowa, Miss. 15th, Ohio, S. C. 16th, Ariz. 17th, Wash., W. Va. 18th, Cal., N. Mex. 19th, Ariz., Colo., Iowa, N. C., Tex., Wyo. 20th, Colo., Iowa, N. Mex., N. C., Tex., Utah. 21st, Colo., Nebr., N. C. 22d, Kans., Minn., N. C., Tenn. 23d, Ariz., Kans., Ohio. 24th, Ariz., Ind. T., Tex. 25th, Iowa, La., Mass., N. Mex., Tex. 26th, Conn., La., N. Y., Ohio, Tenn., Tex. 27th, Colo., Ga., Iowa, Md., N. J., N. Y., N. C., Tenn., Va. 28th, Colo., Fla., N. C. 29th, Colo., Ohio. 30th, Ark., Idaho, Iowa, Mich., Tex.

SLEET.

Sleet was reported as follows: 1st, Ariz., Colo., Kans., N. Mex., Vt. 2d, Colo., Kans. 4th, N. Y. 5th and 7th, Vt. 8th, Conn., N. Y., Ohio, Pa. 9th, Ill., Ind., Ky., Mich., Pa. 10th, Ohio, W. Va. 11th, Oregon. 12th, Kans., Wash. 13th, Iowa. 14th, Ohio. 15th, N. Mex., Ohio. 16th, Va. 17th, Vt. 18th, N. Mex. 19th, Colo. 21st, Wyo. 22d, Minn. 24th, Nebr. 25th, Mass., N. H. 26th, Conn., Mass., N. Y., Pa., Vt. 27th, Vt.

WINDS.

The prevailing winds during April, 1890, are shown on chart ii by arrows flying with the wind. In New England, the middle and northern plateau regions, and the middle and northern Pacific coasts the winds were mostly from northwest to southwest; in the middle Atlantic states from south to northwest; in the south Atlantic states and on the southeastern slope of the Rocky Mountains from south to southwest; in Florida from east to southeast; in the east Gulf states, Tennessee, and the upper Mississippi valley from southeast to southwest; in the west Gulf states from southeast to south; in the Rio Grande Valley from the southeast; at Lake Ontario stations from west to southwest; at Lake Erie stations from north to east; in the Missouri Valley and on the middle-eastern slope of the Rocky Mountains from south to east; over the southern plateau region from south to west; along the south Pacific coast from west to northwest; and in the Ohio Valley, the upper lake region, the extreme northwest, and the northeastern slope of the Rocky Mountains, variable.

HIGH WINDS (in miles per hour).

Maximum velocities of fifty miles, or more, per hour were reported at regular stations of the Signal Service as follows:

3d, 50, s., at Saint Louis, Mo. 6th, 51, se., at Fort Canby, Wash. 7th, 60, sw., at Winnemucca, Nev.; 70, se., at Fort Canby, Wash. 8th, 60, nw., at North Platte, Nebr.; 56, nw., at Cheyenne, Wyo.; 50, nw., at Bismarck, N. Dak.; 54, n., at Valentine, Nebr.; 60, n., at Rapid City, S. Dak.; 54, n., at Dodge City, Kans.; and 54, n., at Fort Elliott, Tex. 9th, 52, w., at Columbus, Ohio; and 53, sw., at Buffalo, N. Y. 10th, 63, w., at Fort Assiniboine, Mont. 11th, 54, ne., at Fort Sully, S. Dak.; 52, sw., at Chicago, Ill. 12th, 56, sw., at Chicago, Ill. 17th, 56, se., at Fort Canby, Wash.

LOCAL STORMS.

On the 2d heavy rain injured crops and caused washouts on railroads at Palestine, Tex. On the 8th severe storms occurred in Illinois, Ohio, Iowa, and Michigan; wind storms prevailed in Wyoming, Nebraska, North Dakota, South Dakota, Kansas, and northern Texas, and a heavy storm was reported on the lower lakes. The report of the Ohio Meteorological Bureau states that severe tornadoes visited Huron, Medina, and Summit counties, Ohio, at 6 p. m., 8th. The Huron county storm pursued a course a little north of east, passing through Norwalk, East Townsend, and Wakeman, after which it moved to the

southeast and apparently lost its force before reaching the eastern line of the county. This storm was undoubtedly a true tornado. A funnel-shaped cloud was reported, which seemed to lift and dip, reaching the earth from time to time, and considerable damage was done to buildings and trees. From the report made by Prof. H. V. Egbert, of Buchtel College, Akron, Ohio, it is evident that the Summit county storm was a continuation of the one reported in Medina county. The tornado seems to have formed near the border line of Montville and Sharon townships, and to have pursued a southeast course across Sharon township for a distance of about five miles, ending about twelve miles west of Akron. It was next felt at a point about four miles southeast of Akron at 7.30 p. m., and from this point it pursued a course of about five miles in a southeasterly direction. The weather was very sultry before the storm and moderately cool afterward. A storm swept over Highland Park, Ill., destroying property to an estimated value of \$40,000, and severe storms, attended by heavy hail, were reported at Roberts and Prophetstown, Ill. On the night of the 9th a severe storm swept along the Rappahannock Valley, Virginia, demolishing trees, etc., and very heavy rain fell. Western Pennsylvania was visited by unusually heavy rain, wind, and electrical storms; severe wind and thunder-storms prevailed in the Lake region; and heavy storms were reported in South Carolina, Georgia, and eastern

Alabama. On the 13th a severe rain and hail storm passed over the northern part of Champaign county, Illinois; the hail-stones were of unusual size, and a large number of cattle were killed. On the night of the 23d-24th an unusually severe thunder-storm passed over Abilene, Tex. Numerous bridges were carried away by swollen streams, much stock was drowned, crops sustained serious damage, and many settlers in Lythe Creek bottom were rescued with difficulty. A heavy thunder-storm, accompanied by hail, occurred the night of the 24th; the hail-stones were compact pieces of ice, oval in form, solid in structure, and about the size of a chestnut. From the 24th to 26th great damage by heavy rains was reported in Texas; large tracts of country in the north-central and central sections of the state were under water, and the inundation extended into Indian Territory. Railroads suffered from washouts and the loss of bridges. On the evening of the 26th a heavy rain and hail-storm passed over the southeastern part of Memphis Tenn., covering the ground with hail-stones as large as hickory nuts. On the 27th, between 3.45 and 4.00 p. m., a heavy hail storm passed southeastward over Baltimore, Md. The hail-stones were very large, many measuring more than two inches in diameter and weighing over four ounces. Thousands of window panes, mostly with western exposure, were broken by the hail. Very heavy rain fell with the hail, 0.80 inch having fallen in fifteen minutes.

INLAND NAVIGATION.

STAGE OF WATER IN RIVERS AND HARBORS.

The following table shows the danger-points at the several stations; the highest and lowest water during April, 1890, with the dates of occurrence and the monthly ranges:

Heights of rivers above low-water mark, April, 1890 (in feet and tenths).

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
<i>Red River:</i>						
Shreveport, La.	29.9	30	30.6	1	26.2	4.4
<i>Arkansas River:</i>						
Fort Smith, Ark.	22.0	28	21.0	1	4.4	16.6
Little Rock, Ark.	23.0	29, 30	24.3	15	10.8	13.5
<i>Missouri River:</i>						
Ft. Buford, N. Dak.		6	4.4	16, 21, 22, 23	0.9	3.5
Sioux City, Iowa.		14	9.5	19	6.5	3.0
Omaha, Neb.	18.0	15	10.0	1, 2	6.4	3.6
Kansas City, Mo.	21.0	14	9.6	1, 30	6.7	2.9
<i>Mississippi River:</i>						
Saint Paul, Minn.	14.5	13	5.5	2, 3	1.5	4.0
La Crosse, Wis.	24.0	18, 19, 20	9.1	2, 3	3.1	6.0
Dubuque, Iowa.	16.0	23, 24	12.1	1, 3	3.6	8.5
Davenport, Iowa.	15.0	26, 27	8.7	2, 3	2.8	5.9
Keokuk, Iowa.	14.0	27, 10, 30	8.4	5	3.2	5.2
Saint Louis, Mo.	32.0	27	18.7	13, 14	12.0	6.7
Cairo, Ill.	40.0	3, 4, 5, 6	48.7	22	33.3	15.4
Memphis, Tenn.	33.0	3, 4, 5, 6	35.6	28	28.0	7.6
Vicksburg, Miss.	41.0	25	49.1	1	46.3	2.8
New Orleans, La.	13.0	3	16.3	30	14.7	1.6
<i>Ohio River:</i>						
Pittsburgh, Pa.	22.0	10	18.8	24, 25	3.6	15.2
Parkersburg, W. Va.	38.0	12	26.6	27	6.8	19.8
Cincinnati, Ohio.	50.0	1	42.0	26	18.9	23.3
Louisville, Ky.	25.0	1	27.6	26	9.0	18.6
<i>Cumberland River:</i>						
Nashville, Tenn.	40.0	1	26.8	16	10.6	16.2
<i>Tennessee River:</i>						
Chattanooga, Tenn.	33.0	20	20.4	16	6.9	13.5
<i>Monongahela River:</i>						
Pittsburgh, Pa.	29.0	10	18.8	24, 25	3.6	15.2
<i>Savannah River:</i>						
Augusta, Ga.	32.0	6	12.2	30	7.4	4.8
<i>Willamette River:</i>						
Portland, Oregon.	15.0	30	10.1	1	5.0	5.1

*On April 1st the zero of the gauge at Memphis, Tenn., was lowered one foot, and all stages of water reported for previous dates should have one foot deducted, for purposes of comparison.

FLOODS.

The extreme flood conditions which prevailed in the lower Mississippi valley during March continued through April. At the beginning of the month twenty-one crevasses or breaks had occurred in the levees of the Mississippi River in Arkansas, Mississippi, and Louisiana. The breaks at Offutt and

Skipwith, Miss., had flooded southern Washington, Issaquena, and western Sharkey counties, Miss.; all of the streets in the upper part of Greenville, Miss., were under water; Huntington, Miss., was inundated, and the land back of Rolling Fork, Miss., and all of the country back of Mayersville, Miss., was flooded. The water flowing from the Nita crevasse had covered the greater portion of Saint James, Saint John, Saint Charles, and Jefferson parishes, Louisiana, as early as the 4th of the month, and on the 13th it reached the Illinois Central Railroad, and within twenty-four hours had covered the tracks for twenty miles. A great amount of water from the Nita crevasse passed into Lake Pontchartrain by means of the Manchac Passes, raising the level of the lake materially, and a high southeast wind on the 22d had the effect of flooding the rear part of New Orleans by driving the water from the lake.

The following is a list of crevasses reported during the month, with the stage and the rise or fall of the river at the more important points:

On the 1st there had been a sharp fall in all the tributaries of the Mississippi, except the Arkansas River, and the Mississippi River was falling from Memphis, Tenn., to Vicksburg, Miss. The stage of the water at Cairo, Ill., was 48.5 feet and rising; at Memphis, Tenn., 35.3 feet and rising; at Arkansas City, Ark., 48.5 feet and stationary; at Helena, Ark., 47.5 feet; at Natchez, Miss., 45.6 feet; at Vicksburg, Miss., 46.3 feet and stationary; at Red River Landing, La., 45.1 feet; at New Orleans, La., 15.9 feet and stationary; and at Baton Rouge, La., 34.9 feet. On the 2d a small break occurred at Bohemia, La., fifty miles below New Orleans; the stage of the river at Cairo, Ill., was 48.6 feet, and the Ohio River at that point had risen 2 feet in eight days. The Tennessee, Cumberland, and upper Mississippi rivers were falling rapidly; the lower Mississippi river was rising at Memphis, Tenn., Vicksburg, Miss., and New Orleans, La., and falling at Helena and Arkansas City, Ark. By the 3d the river had risen slowly at Memphis, Tenn., and had again reached the high-water mark, 35.6 feet; a second break had occurred in the levee at Bohemia. On this date the lower Mississippi river was rising, except at Helena, Ark., and New Orleans, La., where it was stationary. On the 4th the Levee at Catfish Point, Miss., fifty-five miles above Greenville, Miss., broke, the crevasse rapidly widening to 1,500 feet. Three lives were reported lost by the breaking